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ABSTRACT

This paper summarizes the development of educational technology in China from 1949-1966 and from 1976 to the present, and training in educational technology since 1980. It also summarizes research in educational technology--which has recently shifted from an epistemological to a methodological perspective--with higher levels of research being done at Peking Normal University and East China Normal University where the emphasis is on the modernization of educational technology, future development, and policy making. Research at universities and educational technology centers with different orientations from the other two institutions is also discussed, including studies of existing problems and ways to improve the current systems of educational technology. The paper concludes with a discussion of the future of educational technology in China and suggestions for future research in five major areas: (1) remote education; (2) expansion of television universities; (3) design and publication of instructional courseware; (4) computer-assisted instruction in the classroom; and (5) educational communications networks. (CGD)

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Educational Technology Research and Development in The People's Republic of China

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Introduction

In China, educational technology was initially defined as the application of audiovisual media, such as slides, projectors, radio broadcasting and television, to instruction. This application was to facilitate the transition of perceptual knowledge to rational knowledge in the student learning process. Recently, the discipline has shifted itself from the epistemological perspective to a methodological perspective. More and more researchers are interested in analyzing and studying the optimization of instructional systems using the concepts, and methodology developed in system theory. This article summarizes the research and development of educational technology in China.

Audiovisual Instruction Period (1949-1966)

1. Foreign Language Broadcasting School

In the early 50's, foreign language specialists, especially Russian language, were in a high demand. Central Radio Station of China and various local radio stations established many Russian language broadcasting schools. Russian teachers and translators were trained to meet the needs of schools, foreign affairs, and trade. These schools were extended to other foreign languages as needed.

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2. Television University for Adult Education

The development of television technology in late 50's and early 60's brought audiovisual instruction to a new stage. Many cities offered adult education through television stations. They became the first generation of China's television university. In 1960, Peking Television University became the first Open University to offer adult education. By 1966, 8,000 students graduated, and 50,000 students received certificates for completing a single class course. The Shanghai Television University was opened the same year. By 1965, more than 4,800 students enrolled to the program, and 1,200 audited the classes. The admission to open universities required entry examination, and recommendation letters. Usually, a three-year program was equivalent to a vocational school certificate, while a five-year program was equivalent to a college degree.

3. Language Laboratory and Closed-Circuit Television

Language laboratories appeared in schools in the late 50's, mainly for foreign language instruction. A large number of economic and easy to use audiovisual equipment and instructional systems were designed and manufactured. For example, an audio-passive language laboratory contained 50-100 student booths. A language laboratory was suitable for a class of 20-30 students.

At the same time, based on the experience in application of films to teaching, closed-circuit television systems were used in medical schools and various engineering schools. Shanghai Medical College, as an example, used closed-circuit television in surgery and anatomy instruction. TV technology coupled with teachers resulted in a more effective and efficient instruction.

The Rapid Development of Educational Technology (1976 - present)

During the "culture revolution", the formal education system was destroyed. In ten years, we lost 1.6 million university and college graduates. It was estimated that 20 - 30 million workers needed some sort of professional training every year. Obviously, the existing educational system could not meet the needs of such a high demand. The application of educational technology was one of the solutions to the problem.

There were four major factors that contributed to the rapid development of educational technology since 1976: 1) The heavy investment from government; 2) the successful experience in the development of educational technology in other nations; 3) the increasing international exchange in related fields; and 4) a shortage of trained personnel to accomodate China's four major goals of modernization.

1. The Organization of Educational Technology Center

In 1978, the Department of Education established an Educational Technology Bureau in charge of the nation's business affairs related to educational technology. The Central Educational Technology Center was also established, and in charge of educational technology research, development, and services. Since then, similar agencies and centers have been established in various levels of local government. Almost every university has its own educational technology center to enrich the instructional process. Currently, all of these organizations have more then 60,000 educational technology specialists involved in development and evaluation projects, providing daily service to teachers.

2. Television University

Since 1976, the government has spent about 100 million dollars in importing instructional television equipment and educational television

station systems. Part of the equipment went to educational technology centers and universities. Many of them were used in establishing Television Universities. In six years, these universities have enrolled 1.4 million students in nearly one hundred subjects.

Up to 1984, 800,000 students graduated and 400,000 students received certificates for a single class. Although limited in the courses offered, the Television Universities proved to be economic, and efficient for higher education. Research showed that the investment for Television Universities was only 10-20% of the investment for formal universities and colleges. At present, these universities are using commercial TV channels to offer instruction. Current plans are to build several specialized educational television stations to increase the hourly coverage of instruction offered. A communication satellite will be rented to broadcast instructional programs so that the population in rural area will receive the instructional programs. Such a system will benefit universal education, and increase the quality of education. The spread of science and technology through the system will also increase the productivity of industry and agriculture in the rural areas.

3. Video Instructional System

Various educational technology centers, universities, and some high schools have built complete video recording systems, including TV studio control rooms, video editing rooms, and dubbing rooms, etc. The system usually consists of purchased equipment, and locally developed add-on features.

University educational technology centers are the major forces in video program development. Usually, several universities join together in developing a set of programs, and then distribute them to the whole nation. Complete sets of fundamental university level courses, such as physics,

chemistry, biology, history, electronics, and mechanics have been developed. The video programs for high school mathematics and language arts are being developed.

4. Computers in Education

Computer technologies are being used in various levels of educational settings. The Government has invested several hundred million dollars in purchasing the computer equipment to build computer centers. Besides using computers in information indexing, school administration, and programming instruction, some researchers are exploring Computer Assisted Instruction as a new instructional delivery media. The first complete CAI system in China was developed in 1981 to teach the BASIC programming language. Based on a time sharing mini-computer, the system consisted of eight terminals and cassette recorders. The system also had the capability of producing Chinese character output.

At about the same time, microcomputer laboratories were being built in many Children Centers, high schools, and some elementary schools. Such laboratories offer training in computer literacy and programming. Both Peking and Shanghai held computer programming competitions at the elementary, and junior high school levels. Hundreds of pupils participated. These activities promoted the rapid introduction of computer technology into the classroom. As the price of hardware decreses, computer literary will eventual become an integrated part of the school curriculum.

Training in Educational Technology

1. Training

Educational technology is a new inter-disciplinary subject, which consists of knowledge from Pedagogy, Psychology, Electronics, Computer Science, Information Science, and Management Science. Many of these

disciplines are also new to China. Thus, the development of educational technology faces many difficulties due to weak theoretical background, and lack of trained researchers and practitioners. From 1980, many normal universities established departments of educational technology or related majors. Professional certificates (two years of training) and college degree (four years of training) have been granted to media specialists. These graduates are now very active in promoting research and development of educational technology programs. Five universities also developed three-year masters degree programs. Educational technology specialists are also being trained in related departments, such as the instructional design major in the department of education, educational television major in the department of electronics, and CAI major in the department of computer science.

2. Professional Society

Educational Technology Societies have been established in many provinces and cities to promote communications among the fields. A large number of academic conferences, symposiums, and annual conferences have been conducted. Most societies have their own news letters and internal publications. The three distributed magazines are "Educational Technology", "Research in Educational Technology", and "Educational Technology in Foreign Language Instruction".

To conduct media related training sessions is the other major activity of these societies. Usually, such sessions are jointly sponsored by the society, and university or company. These training sessions cover areas like editing skills, equipment maintenance, slide and film production, and computer assisted instruction.. The length of these sessions depends on the program, and may be from one to six months.

Research in Educational Technology

In 1979, the National Educational Committee established two Institute of Modern Educational Technology. Located in Peking Normal University and East China Normal University, the two institutes dedicated themselves to educational technology research. Research activities are also being conducted in universities and educational technology centers with different orientation.

At higher levels, such as the Central Educational Research Institute, and the above two Institutes, the emphasis is on the modernization of educational technology, future development, and policy making, while the lower level centers more emphasis is placed on the existing problems, and the improvement of current systems. Currently, there are ten areas of major research activities:

1. Language Laboratory and Instructional Sound System
2. Techniques of Instructional Film and Video Tape Production
3. Instructional Cable TV System
4. Evaluation of Audiovisual Program
5. Theory of Educational Broadcasting
6. Television Distribution Satellite in Education
7. Computer Based Education
8. ICAI and Instructional Expert System
9. Courseware Design and Related Theory
10. The Application of Information Theory, Control Theory, and System Theory in Education

Most of the research was done in the first seven areas. Many fruitful results have been obtained. In the area of CAI, as an example, studies in the areas of computer assisted language instruction, computer assisted

physics instruction, and computer theory proving, have been advanced. Researchers in the East China Normal University initiated the field in China. In their first CAI system in 1981, the tape recorder system was successfully connected with the computer terminal to create a powerful learning environment. The performance of the system was equivalent to many popular systems in the States at the time.

Currently, although computers are entering some high schools and elementary schools, the applications are restricted mainly in using computers as a learning object, rather than a learning tool. One major barrier is the difficulty in handling chinese character input and output. In 1985,. Peking Normal University developed a chinese language processing system with a 20,000 chinese character bank installed. The system reached a high performance in terms of number of key strokes needed for input, and display speed for output. Artificial intelligence and pattern matching techniques were employed to increase the performance. Besides its value to Chinese language processor research, the system has obvious instructional implications. A CAI package designed on such a system will broaden the computer applications in classroom.

Intelligent CAI recently received much attention. Researchers are studying how to model the instructional activities of experienced teachers. From the simulation of simple activities to more complicated ones, research in CAI and expert systems are combined to create a powerful learning environment. As the theoretical background for ICAI, basic research in artificial intelligence, and cognitive science is also conducted.

Future of Educational Technology in China

China is a developing socialist country with a vast territory. The development in culture, science, and economy are behind that of developed

nations. The nation's goal was the realization of four areas of modernization, agriculture, industry, national defense, and science and technology. Of the four goals, the crucial one is the modernization of science and technology. Education is the foundation to reach these goals. The Chinese Congress has passed a nine-year compulsory education law. However, it is impossible to implement the law based solely on the formal school system. It was estimated that the capacity of high schools could only meet 36% of needs. Higher education could only enroll 1.19% of the related age group. More seriously, one fourth of the population was either illiterate, or near illiterate. About one third of the elementary school teachers were not qualified for the job.

A new educational structure has to be established to meet the high demand for education. The major character of the new educational structure is the use of educational technology. The existing experience with Television university shows that there are ways to build a system that costs less, enrolls more students, results in high efficiency, and maintains a high quality. With the larger investment of the Central Government, and hard work of the educators, there is a bright future of educational technology development in China. Following are five major research areas to be explored in the future:

1. Remote Education

The educational development in China is not balanced among various localities. In remote areas, the economy is not so developed, and there is a weak background for the fast growing demand of education. To solve the problem, the use of a communication satellite for remote education was planned. In two to three years from now, there will be a dedicated instructional satellite launched for remote education. At that time,

students at the remote areas will be able to receive high quality instruction from the satellite. Two months ago, a communications satellite was launched with one bandwidth dedicated to teacher training to accomodate the high demand of classroom teachers.

2. Expanding of Television Universities

In China, there are only about 1000 universities and colleges, which currently have 2 million students enrolled. Every year, less than 800,000 students can enter the formal higher education system. But more than 20 million workers need professional training. In such case, the spare-time education through television universities is the only solution. Thus, more television universities and dedicated educational television stations will be built. Evaluation and comparative research will be done to rationalize the best structure, and organization of the TV university, and the possible instructional methods suitable for use. With the development of the communications industry, TV universities will utilize telephone technology to create a more interactive instructional system.

3. Design and Publication of Instructional Courseware

The Chinese Government has adopted a unified educational system. Across all levels of schools, there are unified education goals, plans, instructional objectives, and textbooks. The best subject experts, and educational technologists work together to design, and produce instructional courseware. Such activity has been proved to be an economical and efficient way of popularizing a technology of teaching. Central Educational Technology Center will continue to direct and coordinate the production of such audiovisual courseware, and publish it along with the textbooks.

4. CAI in Classroom

Exploratory research and development in CAI will continue. In one hand, the primary goal of some research projects is to build CAI systems which can keep up the research and development of CAI systems in developed nations. Also more research will be done in the design of low cost computers with Chinese language processing capabilities. The design of dedicated CAI machines will bring more computers into the classroom.

5. Educational Communication Network

The establishment of a nation-wide educational communication network will be one of primary directions of educational technology research and development. The local network will be built first, and then connected to the national network. With the network, audiovisual learning centers, computer learning centers, instructional resource centers, libraries, and schools will be connected together. Each node in the network will play its role in the instructional process. Then, educational resources across the nation will be shared, and the locality problem in education will eliminated.